REMARKS/ARGUMENTS

Attached hereto is a marked-up version of the changes made to the Description of the Drawings and Specification by the current amendment. Also attached are the drawing replacement sheets for Figs 1-3.

The claims as originally presented were rejected over Kohno either alone or in combination. With respect to Claims 1 and 2 which are combined with the present amendment, it should be pointed out that Kohno is directed to a method of flashing to separate the phases of his gas/liquid mix and is totally silent about and has no interest in utilizing or achieving an increase in the atmospheric temperature differential in an atmospheric heat exchanger as with the present applicant who also processes a mix of both the liquid and gaseous phases of the gas in the vaporizer unlike Kohno who processes only the gaseous phase thereof. Since Kohno is not interested in a similar end result as applicant, it is not believed obvious in view of Kohno to use an increased atmospheric pressure differential in an atmospheric heat exchanger to gain a higher temperature differential and thus increased efficiency of the vaporizer. The fact that Kohno separates his liquid and gaseous phases prior to the vaporizer negates the Examiner's premise—what is not obvious is how to use an increased pressure differential to increase the temperature differential of the single stage

atmospheric temperature air vaporizer by passing the liquid/gas mix directly thereinto after the pressure reduction step.

Claim 3 has been amended to bring out that the side arm vaporizer (secondary external vaporizer) as shown in Fig. 2 is an essential feature of this system including the placement of a pressure control regulator positioned between the liquid tank withdrawal line and the inlet of the vaporizer. If a side arm vaporizer was added to the system without this pressure control regulator described above, then the vaporizer would have the same temperature/pressure profile as the tank. With the presence and action of the valve 20 causes a beneficial increase in the temperature differential versus that for atmospheric air; and by drawing the liquid from the bottom of the tank, a higher pressure due to the liquid head of the liquid level within the tank is available to the vaporizer. This added pressure by the placement and sensing of a liquid head rather than the vapor sensing present in the case of the Martin patent reference enables applicant to obtain the desired increase in the temperature differential between the vaporizing gas within the side arm vaporizer and the outside temperature. Also by drawing from the higher pressure available at the liquid side of the tank, the valve 20 can be used to reduce the pressure and subsequent temperature of the liquid gas entering the vaporizer which additionally more likely assures that

the two phases of the gas (liquid/gas) are present in the vaporizer. Without the valve, the potential of no active boiling of the liquid gas within the vaporizer would take place.

Claim 4 has been amended to better set forth the use environment of the claimed system where the gas is ultimately delivered to a customer line normally including several sub lines, e.g., to a bottler having multiple filling lines, which may start up or shut down for any number of reasons so as to create varying pressure levels at the system exit line. In light of such, it would be unobvious to utilize the Hoy et al patent as a modifier of Kohno since Hoy et al describes a system always venting to a constant pressure (in Patentee's case, this is atmospheric pressure) while the present applicant is, in effect, venting into a customer's supply manifold which varies in pressure, and thus applicant's regulator is protecting against a <u>variable</u> pressure.

In addition, the limitations of Claims 5 and 6 have been added to amended Claim 4.

As such, favorable consideration and allowance of the claims at bar in this application is solicited. However, if the Examiner sees language chances that he believes better defines over the prior art relied upon, such input in the furtherance of allowance in support of the application is welcome.

Respectfully submitted,

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Amendments to the Description of the Drawings:

Please replace the paragraph beginning on Line 4, Page 8 with the following amended paragraph:

Fig. 1 ~~(Sketch S57-1P) shows the Press-Trol~~ is a diagrammatic view of a system of the present invention as set up for Carbon Dioxide with both vaporizer inlet pressure control (to reduce vaporizing temperature) and back pressure control in the vaporizer to prevent solid/slush CO_2 forming as the reduced operating pressure nears the CO_2 triple point.

Please add the following two new paragraphs after Line 8, Page 8:

Fig. 2 is a diagrammatic view showing a modified form of the system shown of the present invention modified to permit higher vaporization of an atmospheric temperature compressed liquefied gas storage tank using an auxiliary atmospheric vaporizer; and

Fig. 3 is a diagrammatic view showing a further modified form of the system of the present invention used to reduce the vaporizing temperature to permit vaporization with atmospheric temperature air of a compressed liquefied gas stored at atmospheric temperature.

Please delete the paragraph beginning at Page 9, Lines 5 - 7 which starts with "Fig. 2 (Sketch S57-2P) shows".

Please add the following three new paragraphs after Line 4, Page 9:

Valve 1 is a liquid carbon dioxide downstream reducing regulator to reduce the liquid feed pressure to the vaporizer so as to allow lower vaporization temperatures. This valve 1 is set between 90 PSIG minimum and 250 PSIG maximum.

The back pressure control regulator valve 2 is set to maintain pressure in the vaporizer above the triple point (freeze point of CO_2) and is thus set within the limits of about 90 PSIG (-55°F) – note the triple point of CO_2 is -69.9°F and 75.10 PSIA.

The vaporizer relief or pressure relief valve 3 is disposed downstream of the vaporizer and upstream of the backpressure control valve 2. This valve is set at a pressure of at least 75 PSIG so as to be above the triple point of CO_2 and a higher pressure above the line pressure of the incoming line of the end user's (customer's) plant, e.g., a multiple-line carbonated bottling plant.

Please replace the paragraph beginning on Line 8, Page 9 with the following amended paragraph:

Now referring to Fig. 2, [[In]] in this embodiment, compressed liquefied propane is stored in a tank 10 at atmospheric temperature at the corresponding pressure. As vapor is withdrawn for use via supply line 12 and customer control pressure regulator 14, the pressure and liquid temperature within the tank 10 is lowered. When the temperature within the tank drops below the instant atmospheric temperature surrounding the tank, heat from the air transfers into the tank 10 since the uninsulated tank is colder than the instant air temperature. This heat transfer may restore the tank pressure or reach equilibrium some degrees below the atmospheric temperature. At high vapor withdrawal rates, auxiliary heat may be provided externally via a pressure maintenance vaporizer 16. Since a liquid head 18 within the tank has a corresponding pressure head, for example, 6 feet of liquid propane has a pressure head of about 1.33 PSI, the boiling point within the external vaporizer 16 may be reduced a corresponding boiling temperature of about 2.5°F by placing a liquid pressure reduction valve 20 into the liquid line 22 feeding

vaporizer 16. Vaporized pressure maintenance vapor re-enters the tank via line 24. This use of the vaporizer assures that the heavy portions of the LP material may be continuously evaporated. ~~In effect,~~ It has been found that an atmospheric vaporizer 16 which has an area exposed to the ambient air equal to the external surface of tank 10 can double the gas withdrawal rate of the tank.

Please delete the paragraph beginning at Page 10, Lines 8 – 11) which starts with "Fig. 3 (Sketch S57-3P shows".

Please replace the paragraph beginning on Line 12, Page 10 with the following amended paragraph:

In [[this]] the embodiment shown in Fig. 3, compressed liquefied gas, e.g., propane, is stored in tank 30 at near the temperature of the vaporizing heating medium, e.g., at the 70°F temperature of the ambient air. Before entering the vaporizer 28, the liquefied gas is passed via line 32 through liquid pressure reduction valve 34 thereby reducing its boiling point. The pressure/boiling temperature reduction provides a greater temperature difference between the

vaporizing temperature and the heating medium thereby increasing capacity. Such an increase when ambient air is used as the heating medium improves the process. Also since atmospheric temperature fluctuates both daily and seasonally, final pressure regulators 36 are placed in gas distribution line 38. Thus by increasing the difference between the vaporizing temperature of the compressed liquefied gas and the temperature of the ambient air available to supply heat to vaporize the liquefied gas, the lower ambient temperatures normally present in colder climate areas are adequate to enable operation of atmospheric vaporizers with no or less added heat supply as by electricity necessitated, thus reducing vaporization costs.

Please add the following new paragraph after Line 8, Page 11:

An example of the Fig. 3 system includes liquid propane stored in the tank at 70°F corresponding to the temperature of the ambient air (70°F) and wherein the pressure of the liquid gas entering the vaporizer 28 is controlled by the liquid pressure reduction valve 34 and set at various pressures to suit the application, e.g., if set at 16.s PSIG, the vaporization temperature would be -40°F;

if 25.4 PSIG, the vaporizing temperature would be -20°F; and if at 38.2 PSIG, then the vaporizing temperature would be 0°F.

Please delete the paragraph beginning at Page 1, Lines 9 – 15, which starts "While there is shown".

"**Version with markings to show changes made**."

Description of the Drawings

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

Fig. 1 ~~(Sketch S57-1P) shows the Press-Trol~~ is a diagrammatic view of a system of the present invention as set up for Carbon Dioxide with both vaporizer inlet pressure control (to reduce vaporizing temperature) and back pressure control in the vaporizer to prevent solid/slush CO_2 forming as the reduced operating pressure nears the CO_2 triple point.

~~Fig. 2 (Sketch S57-2P) shows a modified Press-Trol system to permit higher vaporization of an atmospheric temperature compressed liquefied gas storage tank using atmospheric vaporizer~~.

Fig. 2 is a diagrammatic view showing a modified form of the system shown of the present invention modified to permit higher vaporization of an atmospheric temperature compressed liquefied gas storage tank using an auxiliary atmospheric vaporizer; and

~~Fig. 3 (Sketch S57-3P) shows a Press-Trol system of the present invention used to reduce the vaporizing temperature to permit vaporization with~~

~~atmospheric temperature air of a compressed liquefied gas stored at atmospheric temperature.~~

Fig. 3 is a diagrammatic view showing a further modified form of the system of the present invention used to reduce the vaporizing temperature to permit vaporization with atmospheric temperature air of a compressed liquefied gas stored at atmospheric temperature.

In ~~this~~ the embodiment shown in Fig. 1, compressed liquefied carbon dioxide is stored in pressurized tank 4. As the liquid carbon dioxide flows in the liquid withdrawal line 6, the pressure of such liquefied gas is reduced via the liquid pressure reduction valve 1 before entering vaporizer 5. At the lower pressure, which has a corresponding lower boiling temperature, the liquefied gas is more easily vaporized before entering the customer/gas distribution line 7. To further control the vaporizing pressure and temperature back pressure control, regulator 2 is placed in the vaporizer exit line 8. Pressure relief valve 3 protects the vaporizer from excess pressure in the event of distribution line 7 close off by allowing excess vaporized liquid to escape from the vaporizer. In the case of liquid carbon dioxide, the vaporizer 5 is maintained above the triple point of 75.10 PSIA, corresponding to a boiling temperature of -69.9°F.

Valve 1 is a liquid carbon dioxide downstream reducing regulator to reduce the liquid feed pressure to the vaporizer so as to allow lower vaporization temperatures. This valve 1 is set between 90 PSIG minimum and 250 PSIG maximum.

The back pressure control regulator valve 2 is set to maintain pressure in the vaporizer above the triple point (freeze point of CO_2) and is thus set within the limits of about 90 PSIG (-55°F) - note the triple point of CO_2 is -69.9°F and 75.10 PSIA.

The vaporizer relief or pressure relief valve 3 is disposed downstream of the vaporizer and upstream of the backpressure control valve 2. This valve is set at a pressure of at least 75 PSIG so as to be above the triple point of CO_2 and a higher pressure above the line pressure of the incoming line of the end user's (customer's) plant, e.g., a multiple-line carbonated bottling plant.

Now referring to Fig. 2, [[In]] in this embodiment, compressed liquefied propane is stored in a tank 10 at atmospheric temperature at the corresponding pressure. As vapor is withdrawn for use via supply line 12 and customer control pressure regulator 14, the pressure and liquid temperature within the tank 10 is lowered. When the temperature within the tank drops below the instant atmospheric temperature surrounding the tank, heat from the

air transfers into the tank 10 since the uninsulated tank is colder than the instant air temperature. This heat transfer may restore the tank pressure or reach equilibrium some degrees below the atmospheric temperature. At high vapor withdrawal rates, auxiliary heat may be provided externally via a pressure maintenance vaporizer 16. Since a liquid head 18 within the tank has a corresponding pressure head, for example, 6 feet of liquid propane has a pressure head of about 1.33 PSI, the boiling point within the external vaporizer 16 may be reduced a corresponding boiling temperature of about 2.5°F by placing a liquid pressure reduction valve 20 into the liquid line 22 feeding vaporizer 16. Vaporized pressure maintenance vapor re-enters the tank via line 24. This use of the vaporizer assures that the heavy portions of the LP material may be continuously evaporated. ~~In effect,~~ It has been found that an atmospheric vaporizer 16 which has an area exposed to the ambient air equal to the external surface of tank 10 can double the gas withdrawal rate of the tank.

~~Fig. 3 (Sketch S57-3P) shows a Press-Trol system of the present invention used to reduce the vaporizing temperature to permit vaporization with atmospheric temperature air of a compressed liquefied gas stored at atmospheric temperature.~~

In [[this]] the embodiment shown in Fig. 3, compressed liquefied gas, e.g., propane, is stored in tank 30 at near the temperature of the vaporizing heating medium, e.g., at the 70°F temperature of the ambient air. Before entering the vaporizer 28, the liquefied gas is passed via line 32 through liquid pressure reduction valve 34 thereby reducing its boiling point. The pressure/boiling temperature reduction provides a greater temperature difference between the vaporizing temperature and the heating medium thereby increasing capacity. Such an increase when ambient air is used as the heating medium improves the process. Also since atmospheric temperature fluctuates both daily and seasonally, final pressure regulators 36 are placed in gas distribution line 38. Thus by increasing the difference between the vaporizing temperature of the compressed liquefied gas and the temperature of the ambient air available to supply heat to vaporize the liquefied gas, the lower ambient temperatures normally present in colder climate areas are adequate to enable operation of atmospheric vaporizers with no or less added heat supply as by electricity necessitated, thus reducing vaporization costs.

An example of the Fig. 3 system includes liquid propane stored in the tank at 70°F corresponding to the temperature of the ambient air (70°F) and wherein the pressure of the liquid gas entering the vaporizer 28 is controlled by

the liquid pressure reduction valve 34 and set at various pressures to suit the application, e.g., if set at 16.s PSIG, the vaporization temperature would be -40°F; if 25.4 PSIG, the vaporizing temperature would be -20°F; and if at 38.2 PSIG, then the vaporizing temperature would be 0°F.

~~While there is shown and described herein certain specific structure embodying this invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.~~

Description of the Invention:

Referring to the drawings and in particular Fig. 1, one form of the system of the present invention is shown.

While there is shown and described herein certain specific structure embodying this invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.